Attractiveness of Corn Genotypes to Ovipositing European Corn Borer Moths

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Abstract

About 300 genotypes of corn, *Zea mays* L (inbred lines of dent corn; waxy, sugary, and popcorn inbred lines; and South and Central America exotic genotypes), were evaluated for attractiveness to oviposition by European corn borer moths, *Ostrinia nubilalis* (Hbn.). Inbreds A, R4, W23, and several other lines were relatively unattractive to corn borer moths for egg laying; many lines, including WF9 and L317, were attractive. Differences in corn attractiveness were greater at high levels of oviposition than at lower levels.

Plant height during the oviposition period is the most important plant character influencing attractiveness. To obtain an estimate of the inherent attractiveness, statistical regression methods were used to eliminate the influence of height differences.

Combining unattractiveness to oviposition by corn borer moths with resistance to leaf feeding by first generation corn borer larvae, resistance to sheath-collar feeding by second generation larvae, and tolerance to second generation borers would be desirable. Breeding for resistance to leaf feeding and sheath-collar feeding damage is easy because all plots are artificially infested with corn borer egg masses. Combining the three components of resistance—antibiosis, tolerance, and nonpreference for egg laying—into one genotype, however, would be difficult because determining a satisfactory level of egg laying by the natural moth population is not dependable, and a great amount of work is required in counting eggs on corn plants.

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Attractiveness of Corn Genotypes to Ovipositing European Corn Borer Moths[1,2]

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Introduction

The survival of many insect larvae depends on the sensitivity of the adult to select suitable host plants for oviposition. Moths of the European corn borer, *Ostrinia nubilalis* (Hbn.), lay eggs on a number of plant species, but most are attracted to corn, *Zea mays* L, during the growing season. Corn genotypes exhibit variation in morphological, biochemical, and physiological characteristics, which make these traits suspect of influencing attractiveness to moths for oviposition.

An analysis of preliminary data (*1*) indicated that the differences among 12 inbred lines (in number of eggs per plant) had not occurred by chance after height and maturity, which have been known to influence the number of eggs laid, were taken into account (*2*). With these data as a basis, studies were continued to determine the amount of consistency of differences in the number of eggs laid on different corn genotypes and the inherent attractiveness of inbred lines in single-cross combinations.[6]

Interpretation of Work of Earlier Investigators

Differences in the number of eggs laid on corn varieties have been reported by numerous research workers. One of the earliest reports was by Krasslistchik (*8*), a Russian investigator, who recommended that an American variety, Longfellow Flint, be sown as a trap crop.

Huber and others (*6*) reported differences in oviposition on Golden Bantam and Stowell's Evergreen sweet corn, and between Clarage and Van Wye varieties of dent corn, but attributed these differences to variations in growth habit and size of the corn plants.

Patch (*12*) observed differences in oviposition on six varieties of corn planted on five dates and concluded that they were due to variations in maturity and height. Further study of his data, using the planting date means as the best data from which to estimate the effect of height on the number of eggs laid as proposed by Everly (*2*), revealed one strain, Northwestern Dent, attractive, and two varieties, Red Cob Ensilage and Leaming Dent, less attractive, than their height warranted.

Marston and Dibble (*9*) reported on the number of eggs deposited on different varieties of corn and, although no height data were given, they attributed these differences to height and maturity.

Meyers and others (*10*), presented data on a large group of corn hybrids. The authors used oviposition and plant height measurements only

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[1] Lepidoptera: Pyralidae.

[2] Joint contribution of the United States Department of Agriculture, Science and Education Administration—Agricultural Research, and the Purdue Agricultural Experiment Station, West Lafayette, Ind. 47907 (Paper No. 7724); and the Iowa Agriculture and Home Economics Experiment Station, Ames 50011 (Project No. 2183, Paper No. J-9586).

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[6] Although information was gathered between 1942 and 1950, it is applicable to corn borer research today.

as a means of correcting survival data and did not attempt to study any of these hybrids by inherent attractiveness to the moths for oviposition. A highly significant positive correlation coefficient of 0.721 was obtained between eggs per plot and height of plants on July 11 for 53 single- and multiple-crosses. Four hybrids, Minnesota D $\times$ E, Iowa 266 $\times$ 267, Indiana CB66, and Ohio D.C. No. 1, received a great many more eggs than their height condition would warrant. Similarly, four hybrids, USDA 277 ((2 $\times$ 1) $\times$ (3 $\times$ 6)), Illinois 365, Illinois 761, and Illinois 789, received fewer eggs than expected.

A highly significant positive correlation coefficient of 0.745 was found for eggs and height for 27 single- and multiple-crosses. Two hybrids, Minnesota D $\times$ E and Amargo-Golden Glow, received more eggs per plant than their height would indicate; and four hybrids, Minnesota E $\times$ L and A $\times$ E, Iowa 274 $\times$ 277, and Illinois 365, received fewer eggs than expected. This evidence corroborates the unpublished data of Ficht (table 1) that certain of the early hybrids differed in their relative attractiveness to corn borer moths for oviposition.

Jones and others (*7*) presented data on oviposition on corn hybrids in Virginia and showed significant variations in the number of eggs laid. Although they made no attempt to evaluate this information independently of height and maturity, an analysis of their data gives a highly significant positive correlation coefficient of 0.654 between eggs per plant and height of corn plants on August 17, when approximately all the varieties were 100 percent with silk. Among the hybrids, U.S. 107 and 114 received more eggs and U.S. 44 and A $\times$ Tr fewer eggs than their height warranted.

Fitch (*3*) reported that Northwestern Dent received more eggs than other varieties, although the corn plants were shorter or of equal height. He also reported that the hybrid Golden Cross Bantam sweet corn received more and Johnson County White fewer eggs than the expected 'quota' of eggs when their comparative heights were considered. Fitch stated, "It seems possible that some factor or combination of factors, of which height and maturity are not altogether indicative, assist in rendering these varieties more attractive than the others studied."

Fitch collected extensive data on the oviposition on various types of corn (table 1). His work was done during the early phases of extensive inbred line development and the replacement of open pollinated with hybrids, particularly double crosses. Because of their uniformity, inbred lines and crosses thereof made studies on relative attractiveness and its inheritance more feasible. Germplasm with relation to some of the early inbred lines is still being used in current hybrids and breeding programs. By permission of the Purdue Department of Entomology, these data have been studied and the results are included to show that there were distinct differences in the attractiveness of these early genotypes (averaged over years, a range of 14.9 eggs per plant for Purdue 11 to 69.4 eggs per plant for 66 $\times$ L).

Methods and Materials

To evaluate adequately the attractiveness of corn lines to corn borer moths, a high level of egg deposition must be available. Owing to its more advanced maturity, greater height, and vigor, early planted corn receives more eggs than corn planted later. Therefore, planting the corn to be studied as early as possible is desirable. This is especially true when the slower growing inbred lines are being evaluated for first brood (early summer) oviposition of the polyvoltine borer strain, which lay their eggs in mid-June, when plants are approximately 50 to 60 cm tall.

Patch and others (*13*) reported that the difference between the number of eggs laid on plants of different heights is much greater when the general average height of the plants is low than when the general average height is high. Thus, during the first brood period of oviposition, small differences in height can produce a large effect on the number of eggs laid. Inbred lines, if planted at the same time as surrounding hybrid corn, would be in competition with the more vigorous growing corn and would receive few eggs.

In 1942, 12 inbred lines of dent corn, replicated 8 times, were planted on May 11 under good cultural conditions in 105 cm rows of 27 plants, spaced about 52 cm apart. Two plants in each plot were tagged and examined every third day during the first generation period of oviposition. These plants were selected for their uniformity of height and general appearance, as judged by the rest of the plants in the row. Egg deposition

Table 1.—*Attractiveness of corn genotypes to oviposition by corn borer moths adjusted for genotype height differences and common mean of 40 eggs per plant*[1]

Genotype	Eggs per plant 1934	1935	1936	1937	Average
Tr	—	—	40.5	38.1	39.3
66	—	—	37.1	35.1	36.1
Tr × Krug	23.9	63.5	—	—	46.2
66 × Lan	25.1	—	—	—	25.1
B2 × Tr	26.3	44.5	—	—	35.4
R4 × Tr	31.0	—	—	—	31.0
A × Tr	39.4	—	—	—	39.4
Tr × L	41.8	27.9	—	—	34.9
66 × Tr	51.3	23.4	45.9	42.7	40.8
Pr × 66	—	39.6	—	—	39.6
66 × L	—	69.4	—	—	69.4
8 × T9	—	—	35.7	33.8	34.8
46 × C2	—	—	62.5	56.6	59.5
Tokeo × H6 Ind	—	24.9	—	—	24.9
(A × L) × Tr	15.5	—	—	—	15.5
(W77 × R4) × Tr	17.9	—	—	—	17.9
(66 × R4) × Tr	39.4	—	—	—	39.4
(L × Tr) × 66	41.8	22.3	50.4	45.9	40.1
(K × L) × 66	51.3	—	—	—	51.3
(WC4 × B2) × H6	65.7	—	—	—	65.7
(Hy × R) × Tr	—	16.0	—	—	16.0
(H6 × 66) × Tr	—	26.2	—	—	26.2
(66 × Tr) × P	—	29.6	—	—	29.6
(A × L) × P	—	48.6	—	—	48.6
(KE × B2) × Tr	—	—	42.1	39.2	40.7
(66 × Tr) × (A × L)	26.8	—	—	—	26.8
(66 × WF9) × (R4 × Tr)	30.9	—	—	—	30.9
(Hy × R4) × (66 × Tr)	52.5	—	—	—	52.5
(I205 × L209) × (66 × Tr)	40.6	—	—	—	40.6
(A × L) × (66 × Tr)	31.0	—	—	—	31.0
(66 × Tr) × (F × L)	—	73.3	—	—	73.3
Wisconsin 8	—	—	36.1	—	36.1
Wisconsin 25	—	—	37.1	—	37.1
Country Gent. × 22	—	—	46.6	42.8	44.7
Country Gent. × IN22	—	—	47.8	44.1	46.0
Purdue Bantam	—	—	44.3	40.6	42.5
Golden Bantam	—	—	37.1	41.3	39.2
Reid Yellow Dent	—	—	27.8	—	27.8
Maize Amargo	—	—	31.4	—	31.4
Country Gentleman	—	—	31.6	—	31.6
Huron Yellow Dent	—	—	34.1	—	34.1
Golden Cross Bantam	—	—	34.5	—	34.5
Dent De Cheval	—	—	40.0	—	40.0
Woodburn Y.D.	37.0	—	—	—	37.0
Bryant Reid Y.D.	46.6	66.2	—	—	56.4
Clement White Cap	57.3	65.7	36.8	34.8	48.6
Krug	69.2	43.2	—	—	56.2
Purdue 11	—	14.9	—	—	14.9
JCW1	—	41.1	—	—	41.1

[1] Unpublished data of G. A. Ficht, Auburn, Ind.

was low, probably because of the effect of competition of single- and double-cross dent corn in the surrounding area.

In the tests of corn inbred lines, several methods were tried to obtain plants as tall and vigorous as possible at the time of oviposition to reduce the competition with surrounding corn.

Because the average number of eggs laid per plant in 1942 was low, in 1943 the plants were started in small wooden transplanting boxes in the greenhouse on April 15 and were transferred to the field on May 1, when about 25 cm tall. Even though the plants suffered a slight setback, they were probably further advanced than corn planted in the field the first week in May. The plots were arranged in two 12 × 12 latin squares with a single plant to a hill (12 replications, 1 plant per replication of each inbred) spaced 105 cm each way. To prevent excessive moisture loss and possible cold injury, the plants were covered with dome-shaped waxed paper caps anchored to the ground with soil around the edges. These caps were removed 1 week later.

Heavy and frequent rainfall throughout May and early June flooded the field so the effect of the transplanting operation on the corn plants was not readily apparent. The excessively wet conditions, however, resulted in symptoms of severe nitrogen deficiency. To overcome this condition, the plants were treated on May 31 with a solution of 1 lb of sodium nitrate plus 1 lb of 3-12-12 fertilizer dissolved in 20 g of water. After the soil about the plants had been loosened with a small hand trowel, one-half pt of this solution was applied in a circle about 30 cm in diameter around each plant. This treatment resulted in a more normal appearance of the plants, although it did not completely overcome the effects of the adverse environmental conditions. A few transplants died, so data from the 2 squares were combined and analyzed as means composed of 12 samples.

In 1944 the experimental setup was modified by increasing the plot sizes, planting early, and immediately covering the hills with commercially available wax paper caps. These paper coverings increased the germinating speed by lowering the heat radiation from the soil at night, kept the soil surface loose and friable, and protected the small plants from frost injury until such danger had passed. Because this method resulted in good germination and well advanced plants for studying early oviposition, it was used in all succeeding

tests with inbred lines, or where it was desirable to obtain early germination and growth. The experimental design was similar to that of 1943 and consisted of a single 12 × 12 latin square (12 replications of 2 plants each).

To study the number of moth eggs laid on an attractive and an unattractive inbred line over a range of growth conditions, a date-of-planting experiment was designed. Four dates of planting of attractive inbred line WF9 and unattractive inbred line A were made. Each plot consisted of three single-plant hills, and the plots were arranged in two 8 × 8 latin squares. The first planting was made April 21 and immediately covered with the waxed paper caps. Each succeeding planting was made when the plants of the preceding planting had emerged from the soil.

To facilitate recording of data, plants in the experiments were numbered consecutively with garden stakes. The data were recorded by experiment and plant number. Each plant was examined for eggs every third day in 1942 and every other day the following years.

In 1942 and 1943, brass clips were attached to the leaf margin near the egg mass. When egg deposits were heavy, marking egg masses close together was difficult. A large number of clips on the leaf caused shredding in wind storms, and often clips became detached and lost. In following experiments, eggs were removed after they were counted, or, if survival data were desired, the masses were identified by encircling them with indelible ink.

At a date near the middle of the egg laying period, each plant height was measured to the tip of the longest leaf held upright. This height measurement was used as an index of competition from the different kinds of corn. Stage of development records based on the mean silking date were taken in 1942 and in those experiments where attractiveness was studied during the late summer oviposition period. The mean silking date was obtained by recording when the first silks appeared, in days, after July 1. No significant correlation was found between maturity and the number of eggs laid during the early summer period. Everly (2) reported that maturity had little influence in determining the number of eggs laid on dent corn when oviposition occurred relatively early in plant development.

In all these early summer experiments, average height at midoviposition was used to determine the relative attractiveness of corn to the moths. Regression methods described by early investigators were used to obtain a measure of the eggs laid per plant independent of height (*1, 3, 10, 11, 12*). Deviations from the expected number of eggs laid, for conditions of the genotype height, from the number actually observed, were used to measure the relative attractiveness of the lines.

Similar methods were used to determine the resistance to larval survival in different strains of corn (*10, 13, 14*). The errors of estimate based on the error regression were used to measure the significance of the deviations and to evaluate the differences found among the genotypes. The relative consistency in the performance of most of the corn tested from year to year is a good criterion of this method of evaluating genotypes for their attractiveness to ovipositing moths.

Results and Discussion

To compare inbred lines as such or in single-cross combination, tested under different environmental conditions and different levels of oviposition, some method of placing the various corn genotypes on a comparable basis had to be developed.

A study of the eggs laid on attractive and unattractive types of corn planted in the date-of-planting tests in 1944, 1945, and 1946, indicated that differences in the number of eggs laid on the two corn hybrids became proportionately larger as the level of eggs deposited became higher (table 2). The correlation of differences between the attractive and unattractive hybrids in number of eggs laid per plant versus level of oviposition was 0.965. Regression accounted for 93 percent ($100 \times r^2$) of the variation in the differences. There are relatively few data on differences at levels above 70 eggs per plant, so the relationship may assume curvilinearity at extremely high levels of oviposition. Because this relationship appears linear for oviposition levels, under which most of these tests were conducted, it was decided that in converting the number of eggs laid to a common mean, proportional rather than absolute differences should be used. The method used was to correct the number of eggs observed on the different entries for differences in plant height and then

Table 2.—*Differences in eggs adjusted for height differences on attractive and unattractive dent corn compared with average number laid on different planting dates. Lafayette, Ind.*

Planting	Eggs per plant					
	1944		1945		1946	
	Oviposition levels	Difference between corn types[1]	Oviposition levels	Difference between corn types[2]	Oviposition levels	Difference between corn types[2]
First	29.1	21.2	40.1	46.4	144.0	11.5
Second ..	22.6	16.1	31.3	41.6	71.4	74.1
Third ...	10.8	14.4	19.7	16.4	56.1	33.8
Fourth ..	1.8	.1	1.1	.6	40.3	31.8
Fifth	—	—	—	—	14.4	9.5

[1] Attractive inbred line WF9 and unattractive inbred line A were used in 1944.

[2] Attractive single-cross Ia.L317 × Ind. Tr. and unattractive single-cross Ill.A × Wis. W23 were used in 1945 and 1946.

to adjust these corrected data to a common mean. This was accomplished by dividing the selected common mean by the mean of the experiment in which the genotype was tested and then multiplying the number of eggs per plant, adjusted for height differences, by this factor for each entry in the experiment.

Since the 1944 experiments, which were conducted under ideal environmental conditions so far as rainfall and temperatures were concerned, had an average of 40 eggs per plant (about 2 egg masses), this mean was used to standardize the various genotypes tested so they could be evaluated on a reasonably comparable basis.

1942 to 1944 Experiments

A preponderance of data supports the effect of plant height on oviposition. All data, therefore, were adjusted for differences in genotype height.

Cultural conditions were excellent in 1942, but oviposition from the corn borer population was low (table 3). Inbreds A, R4, and W23 were unattractive to corn borer moths; WF9 and L317 were highly attractive. The abnormal growing conditions in May and early June of 1943 may have interferred with the normal development of the inbred lines and thus modified their attractiveness to the moths. The level of oviposition was higher than in 1942 (table 3). Inbred A was the least attractive and WF9 the most attractive. R4 and W23 were among the least attractive, and L317 was above average in attractiveness (table 3).

The excellent cultural conditions in 1944, coupled

Table 3.—*Attractiveness of dent corn inbred lines to corn borer moths measured by eggs laid per plant. Lafayette, Ind.*

Inbred line	Plant height in inches at mid-oviposition			Eggs per plant: Observed			Adjusted for height differences			Adjusted to mean of 40 eggs		
	1942	1943	1944	1942	1943	1944	1942	1943	1944	1942	1943	1944
Ill.A	23	19	27	2.9	8.2	10.0	0.1	7.7	8.7	0.5	6.8	8.7
Ill.R4	23	17	30	4.6	9.6	41.1	2.1	36.5	27.8	10.9	32.5	27.8
Wis.W23	22	19	28	4.8	33.7	26.6	4.0	33.7	19.5	20.8	30.0	19.5
Ind.Tr	23	22	31	7.4	66.3	79.3	4.9	29.2	61.5	25.4	26.0	61.5
Ill.Hy	24	21	29	9.0	63.2	35.9	5.3	41.1	27.2	27.5	36.6	27.2
US Cl.187-2 ..	17	19	20	1.0	62.0	14.7	7.0	66.9	42.3	36.4	59.6	42.3
Ind.38-11	25	—	—	12.5	—	—	7.3	—	—	37.9	—	—
Kans.K230	19	17	24	4.8	26.7	26.6	8.2	50.6	36.9	42.6	45.1	36.9
Ia.I205	16	—	—	1.0	—	—	8.2	—	—	42.6	—	—
US Cl.540 ...	19	17	23	7.1	33.9	21.0	10.8	54.8	37.1	56.1	48.8	37.1
Ind.WF9	24	23	30	20.1	122.5	61.8	16.2	70.4	48.5	84.1	62.7	48.5
Ia.L317	18	16	26	13.8	19.0	82.5	18.8	50.9	84.1	97.7	45.3	84.1
Ohio Oh40B .	—	21	—	—	62.0	—	—	43.9	—	—	39.1	—
Ill.90	—	15	—	—	31.7	—	—	52.6	—	—	46.8	—
Ind.P8	—	—	21	—	—	12.7	—	—	34.6	—	—	34.6
Ill.R45	—	—	31	—	—	69.2	—	—	48.9	—	—	48.9
Av.	21	19	27	7.4	44.9	40.1	7.7	44.9	40.1	40.2	39.9	40.1
L.S.D. .05 ...	1.2	2.5	1.6	9.7	39.0	17.5	9.7	28.8	16.3	52.4	25.6	16.3

with the advanced plant growth and the heavy egg deposits in general, suggested that differences in number of eggs laid on the inbred lines were probably more nearly an accurate expression of differences in attractiveness than was shown in 1942 and 1943. The data substantiated those from 1942 and 1943, with respect to the relative unattractiveness of inbred lines A and W23 (table 3).

For information on the performance constancy of an attractive and unattractive inbred line under varied conditions of growth, a date-of-planting experiment was designed using unattractive inbred A and attractive WF9. The four planting dates and two inbred lines were completely randomized with three single-plant hills per plot in two 8×8 latin squares. The corn was planted April 21 and May 3, 10, and 16 (table 4).

Significant differences were shown among the planting dates and inbreds for both the eggs laid per plant and the average plant height at midoviposition. No significant differences were shown between the two latin squares. All the interactions were insignificant, except that between plantings and inbred lines for number of eggs per plant. The average number of eggs laid and the height of the corn for the various planting dates were shown to be curvilinear by Everly (2), and the second degree equation $Y = 45.8 - 5.49X + 0.17X^2$ best fitted the relationship.

Using this equation as the best estimate of the relation of eggs per plant and height of corn at midoviposition, data for the two inbred lines were adjusted for plant height differences on the basis of the mean height for the respective planting dates. Inbred A received fewer than the average for the experiment in all planting dates, whereas WF9 was above average in all except the last planting (table 4). The third planting of inbred A received a much lower complement of eggs for the average height of the corn than was expected. This might indicate that attractive height for different inbreds may vary, and that inbred A has a higher minimum attractive height than does WF9. These data show that the factors within these inbred lines that modify the attractiveness to moths for oviposition are effective in equivalent degree in different plant development stages under similar environmental conditions.

Table 4.—*Early summer oviposition on two dent corn inbred lines with height of corn plants at midoviposition. Lafayette, Ind., 1944*

Planting date	Latin square	Plant height in inches of corn at midoviposition		Eggs per plant: Observed		Eggs per plant: Adjusted far height differences[1]	
		Ill.A	Ind.WF9	Ill.A	Ind.WF9	Ill.A	Ind.WF9
April 21	I	27.0	31.2	11.9	44.4	20.2	34.2
	II	27.0	31.0	8.5	54.4	16.8	45.3
	Av.	27.0	31.1	10.2	49.4	18.5	39.8
May 3	I	25.5	29.4	6.7	35.8	13.2	27.3
	II	25.1	28.9	8.2	40.6	15.9	34.3
	Av.	25.3	29.2	7.4	38.2	14.6	30.8
May 10	I	22.3	24.8	1.0	23.7	3.9	20.3
	II	22.3	24.3	.5	17.9	3.4	15.9
	Av.	22.3	24.6	.8	20.8	3.6	18.1
May 16	I	17.2	18.8	1.2	2.7	1.4	1.9
	II	15.7	18.6	1.3	1.8	1.7	2.1
	Av.	16.4	18.7	1.2	2.2	1.6	2.0

[1] Eggs per plant adjusted ta average height far respective planting date and nat to the average far the experiment.

1945 Experiments

The 1942 to 1944 tests showed that sufficient differences existed in attractiveness to moths among inbred lines of dent corn to warrant further investigations with more extensive material. In 1945, an attempt was made to obtain most of the commonly used inbred lines in the Corn Belt at that time. These lines were planted early in six replicated blocks and covered with wax paper caps to hasten germination and early growth. The area was exposed to short flooding periods in May; however, plant growth was reasonably satisfactory.

Statistically significant differences were shown among the entries, both for number of eggs laid and for the average height of the plants. There was a regular gradation from few to numerous eggs per plant, and no definite break could be made between attractive and unattractive lines (table 5). As in previous years, however, inbreds W23 and R4 were relatively unattractive. Inbreds H22, B2, L289, A47, and Cl.187-2 were also among the most unattractive to the moths for oviposition. Among the most attractive lines was L317. WF9 ranked fourth in unattractiveness, but this line was influenced by adverse environmental conditions in respect to pollen production, growth, and other characters. Therefore, the unseasonably wet growing conditions may have affected its physiology

Table 5.—*Attractiveness of inbred lines to corn borer moths measured by eggs laid per plant. Lafayette, Ind., 1945*

Inbred line	Mid-oviposition plont height in inches	Eggs per plant		
		Observed	Adjusted for height differences	Adjusted to meon of 40 eggs
Wis.W23	20	5.5	0.3	1.1
Ind.H22	16	2.8	4.6	17.0
III.A	14	2.2	6.3	23.3
Ind.WF9	17	7.1	6.4	23.7
Ind.B2	16	5.5	6.7	24.8
Io.L289	18	8.7	6.9	25.6
N.J.A47	19	11.4	7.5	27.8
USCI.187-2	13	1.7	7.6	28.1
III.R4	14	4.0	7.7	28.5
Kons.K55	12	.4	8.2	30.4
Ind.66(3709B)	14	3.4	8.2	30.4
III.90	13	3.3	8.3	30.7
Ind.33-16	17	9.2	8.3	30.7
III.Hy	15	5.9	8.4	31.1
Ind.H5	16	7.3	9.0	33.3
Kons.K4	12	1.8	9.3	34.4
Kons.K6	16	8.7	9.4	34.8
Ind.Tr	16	8.3	9.5	35.2
Kans.K64	13	4.9	9.9	36.7
Kons.K63	11	2.0	10.0	37.0
Ind.H21	11	1.8	10.4	38.5
Mich.MS I	15	7.7	10.5	38.9
III.M-14	16	9.0	10.5	38.9
Wis.W26	14	8.0	10.6	39.2
Kons.K41	15	7.6	10.8	40.0
Io.Os420	12	3.2	10.9	40.4
Ia.I234	13	6.0	11.0	40.7
N.J.B42	22	19.2	11.9	44.1
Kons.Kys	12	4.8	11.9	44.1
N.J.A30	13	.4	12.3	45.6
Ind.38-11	18	14.4	12.5	46.3
Ind.P8	13	6.7	12.7	47.0
III.L	15	9.7	12.8	47.4
Mo.940	12	6.2	13.3	49.2
III.R30	10	3.1	13.3	49.2
PBMBR	10	4.0	13.9	51.5
Io.L317	15	12.8	15.4	57.0
Ohio Oh07	14	14.3	18.0	66.7
Ind.Pr	14	13.6	18.3	67.8
Kons.K44	17	19.3	19.4	71.8
N.J.A64	16	18.3	19.8	73.3
III.R7	15	20.2	22.2	82.2
Io.Ldg.	16	21.6	22.3	82.6
Woxy inbred lines of dent corn and their nonwoxy porents				
III.wxHy(Ia)	19	3.0	.1	.4
III.wxHy(Wis)	16	12.6	13.2	48.9
III.Hy	15	5.9	8.4	31.1
Wis.wxW23	18	3.7	2.3	8.5
Wis.W23	20	5.5	.3	1.1
Wis.wxW26	17	2.2	1.4	5.2
Wis.W26	14	8.0	10.6	39.2
III.wxA(Wis)	14	1.2	4.9	18.1
III.A	16	2.2	6.3	23.3
III.wxR4(Wis)	16	4.1	5.4	20.0
III.R4	14	4.0	7.7	28.5
US wx187-2	14	.5	5.4	20.0
US 187-2	13	1.7	7.6	28.1
Ia.wxL289	19	14.8	11.2	41.5
Io.L289	18	8.7	6.9	25.6
Ind.wxWF9	23	20.5	11.6	43.0
Ind.WF9	17	7.1	6.4	23.7
Ia.wxOs420(US) ..	19	20.2	17.2	63.7
Ia.wxOs420(Io) ...	17	17.9	19.4	71.8
Ia.Os420	12	3.2	10.9	40.4
III.wxM14	18	18.2	17.5	64.8
III.M14	16	9.0	10.5	38.9
Wis.wxW32	13	1.7	6.9	25.6
wx2041B	14	4.6	9.2	34.1
wxWR3	17	13.0	12.7	47.1
Ia.wxOs426(US) ..	19	20.4	17.7	65.6
Av.	16	9.2	—	40.0
L.S.D. .05		7.8	7.4	32.2

and thus its attractiveness to the moths. Other lines that were attractive included Oh07, Pr, K44, A64, R7, and Ldg.

Attractiveness of converted waxy inbred lines (which differ primarily in the waxy characteristics of the endosperm) with their nonwaxy parent lines is tabulated in table 5. Other factors possibly affecting growth and attractiveness to moths were also brought along either in the process of transference or through linkage with the waxy gene. Most of the waxy lines were not significantly different in attractiveness from their nonwaxy counterparts. Waxy Hy developed in Iowa was significantly less attractive than was Waxy Hy developed in Wisconsin (0.4 eggs/plant versus 48.9 eggs/plant).

1947 Experiments

Dent corn inbreds R4 and A were again unattractive in 1947. In addition, 38-11 and Oh51A were unattractive. W23 and WF9 did not perform as in past years. Indiana P8 was slightly more attractive than previously (table 6). Compared with L317 and P8, several popcorn and sugary recovered

Table 6.—*Attractiveness of corn genotypes to corn borer moths measured by eggs laid per plant. Lafayette, Ind. 1947*

Inbred line	Mid-ovipositian plant height in inches	Eggs per plant: Observed	Eggs per plant: Adjusted far height differences	Eggs per plant: Adjusted to mean af 40 eggs
		Dent Carn Lines		
Ind.38-11	23	4.8	3.6	7.5
Ill.R4	23	8.0	6.8	14.2
Ill.A	22	6.4	7.3	15.2
SSS278-28	24	11.2	7.9	16.4
Ohia 51A	23	11.2	10.0	20.8
Ia.L304A	24	14.4	11.1	23.1
Kans.K1409	20	6.4	11.6	24.2
Ind.WF9	25	17.6	12.2	25.4
Ind.H10	21	16.1	12.7	26.4
Kans.K64	20	8.0	13.2	27.5
US CI.540	20	9.6	14.8	30.8
Ind.B2	21	12.8	15.9	33.1
Ill.Hy	27	25.6	16.0	33.3
Wis.W23	19	9.6	16.9	35.2
Ind.H11	26	25.6	18.1	37.7
Ia.L289	26	27.2	21.5	44.8
US CI.187-2	18	14.4	23.8	49.6
Kans.K155	20	19.2	24.4	50.8
459-1	23	27.2	26.0	54.2
Ind.H12	24	30.4	27.1	56.4
616-1-11-5	26	36.8	29.3	61.0
458-1	24	33.6	30.3	63.1
763-1-5-5	17	19.2	30.7	64.0
Ind.P8	21	28.8	31.9	66.5
Ia.L317	19	30.4	37.7	78.5
Ind.Tr	28	52.8	41.1	85.6
Av.	22	19.2	19.2	40.0
L.S.D. .05		23.3	19.9	35.5
		Papcorn Lines		
2733 Sq 39-2	28	0	— .4	.7
2048 AP A3-4-1	28	1.9	1.5	10.0
3025 WR 4519 2-41	26	1.9	2.2	14.7
2708 SO 30A-1	24	1.9	2.8	18.7
2043 ARA 1-5-6	30	4.0	3.0	20.0
2044 ARA 1-5-7	26	4.0	4.3	28.7
2094 BG 1708 3-4.	25	4.0	4.6	30.7
2698 SO 18-6	29	6.1	5.4	36.1
2151 SA 1190-3	28	6.1	5.7	38.1
2690 SO 16-6	23	6.1	7.3	48.8
2111 SA SA 24-5	25	8.0	8.6	57.5
2251 SA 1490 5-5.	35	12.0	9.3	62.2
2519 SA 194 7-4	27	9.9	9.8	65.5
2085 BD 1706 3-1	26	9.9	10.2	68.2
2141 SA 1188-5	30	12.0	11.0	73.5
Illinais A	28	1.9	1.5	10.0
Illinais R4	26	1.9	2.2	14.7
Iawa L317	21	6.1	8.0	53.5
Indiana P8	26	12.0	12.3	82.2
Av.	27	6.0	6.0	40.0
L.S.D. .05		8.6	7.7	18.3
		Sugary Recavered Lines		
(R4 × P119)⊗ × R4 ⊗-2	24	24.0	20.0	47.6
(R4 × 13)⊗su × R4 ⊗-1	25	17.6	11.5	27.4
(R4 × P39)⊗su × R4 ⊗-1	20	4.8	9.2	21.9
(187-2 × P39)⊗su × 187-2 ⊗-3	19	12.8	19.3	46.0
(Tr × 13)⊗su × Tr ⊗-1	29	38.4	23.9	56.9
(Hy × 13)⊗su × Hy ⊗-1	24	24.0	20.0	47.6
(540 × 13) × 540 × 540 ⊗-1	23	16.0	14.1	33.6
(A × 13) × (A × A) -1	21	3.2	5.5	13.1
Illinais A	19	1.6	8.1	19.3
Iawa L317	17	24.0	34.7	82.6
Av.	22	16.8	16.8	40.0
L.S.D. .05	—	24.4	18.0	44.3

lines were unattractive to oviposition (table 6). A few Mexican and Central and South American genotypes, crossed on unattractive inbred 38-11, were almost as unattractive for oviposition as was unattractive single cross A × W23 (tables 7 and 8).

1948 to 1949 Experiments

In the 1948 uniform nursery tests (table 9), several inbred lines were equal to or lower in attractiveness than inbred line A, and several lines were equal to or greater in attractiveness than L317, one of the slow growing but most attractive inbreds. Because the level of oviposition was quite low in these tests, some of these low values may be due to escapes, particularly of those inbreds that were below average in height. However, certain inbred lines, such as R30, R2, 38-11, Os426, 224, L289, Ky27, C14, A148, A71, A375, A34, ND5, Oh51A, Oh28, Oh40B SD102, USDA C1.7, CI.43, W9, W16, W20 and W22, were considerably above the average height, yet the number of eggs these lines received, independent of their height, was

Table 7.—*Attractiveness of corn from Chiapas, Mexico, crossed on Indiana 38-11, to corn borer moths measured by eggs laid per plant. Lafayette, Ind., 1947*

Variety	P.E.I. number	Height in inches at 50 percent oviposition	Eggs per plant: Observed	Eggs per plant: Adjusted for height differences	Eggs per plant: Adjusted to mean of 40 eggs
125	158271	36	43.2	36.4	21.5
176	158355	35	44.8	42.2	24.9
30	158330	34	48.0	49.7	29.3
158	158354	40	78.4	54.4	32.1
137	158272	34	52.8	54.5	32.2
25	158254	32	44.8	55.1	32.5
141	158273	38	72.0	56.6	33.4
29	158329	33	52.8	58.8	34.7
127	158347	35	62.4	59.8	35.3
38T	158332	34	59.2	60.9	35.9
59	158341	34	59.2	60.9	35.9
56	158339	32	51.2	61.8	36.5
24(4654) ..	158328	33	56.0	62.0	36.6
99	158270	36	72.4	63.6	37.5
39	158333	33	57.6	63.6	37.5
58	158340	36	72.0	65.2	38.5
8(4323) ...	158326	30	46.4	65.2	38.5
66	158343	34	64.0	65.7	38.8
177	158356	34	64.0	65.7	38.8
153	158353	35	68.8	66.2	39.0
143	158350	33	60.8	66.8	39.4
31	158331	36	73.6	66.9	39.5
135	158349	31	52.8	67.4	39.8
53	158260	33	65.6	71.6	42.2
129	158348	35	75.2	72.6	42.8
60	158342	34	76.8	78.5	46.3
48	158335	38	94.4	79.0	46.6
64	158265	34	80.0	81.7	48.2
144	158351	34	81.6	83.3	49.1
55	158338	34	84.8	86.5	51.0
54	158337	36	104.0	97.2	57.3
96	158334	32	80.0	90.6	53.4
182	158357	34	91.2	92.9	54.8
52	158336	36	107.2	100.4	59.2
61	158264	35	104.0	101.4	59.8
A × W23 .		33	38.4	44.4	26.2
Tr × 38-11 .		36	68.8	62.0	36.6
Av.		34	67.8	67.8	40.0
L.S.D. .05		—	38.4	35.2	20.8

Table 8.—*Attractiveness of corn varieties from Central and South America, crossed on Indiana 38-11, to corn borer moths measured by eggs laid per plant. Lafayette, Ind., 1947*

Variety	Origin	P.E.I. number	Height in inches at 50 percent Ovi-position	Eggs per plant: Observed	Eggs per plant: Adjusted for height differences	Eggs per plant: Adjusted to mean of 40 eggs
4(4318)	Guatemala	158253	49	44.8	27.0	19.6
975-1	Colombia	158304	32	28.8	26.9	19.5
1277-1⊗	Colombia	158279	31	32.0	35.9	26.0
IV 1503-2-3⊗ .	Costa Rica	158318	34	36.8	36.2	26.2
22	Guatemala	158284	34	40.0	40.2	29.1
M-6	Bolivia	158361	27	33.6	42.3	30.6
IV 1710-3-3⊗ .	Colombia	158320	38	48.0	43.4	31.4
IV 502-2-3⊗ ..	Costa Rica	158313	37	70.4	43.4	31.4
968-1⊗	Colombia	158275	28	36.8	44.3	32.1
IV 507-4-3⊗ ..	Colombia	158314	34	44.8	45.0	32.6
IV 38-8-3⊗ ..	Costa Rica	158311	35	46.4	45.4	32.9
IV 190-3-3⊗ ..	Costa Rica	158312	33	44.8	46.2	33.5
1284-2⊗	Colombia	158309	34	48.0	48.2	34.9
9-669-1⊗	Vera Cruz	158284	30	46.4	51.5	37.3
IV 576-2-3⊗ ..	Costa Rica	158302	33	51.2	52.6	38.1
1048-11⊗	Colombia	158276	38	59.2	54.6	39.6
M5	Bolivia	158360	29	49.6	55.9	40.5
1048-32⊗	Colombia	158277	30	51.2	56.3	40.8
IV 523-1-3⊗ ..	Costa Rica	158301	37	60.8	57.4	41.6
1048-37⊗	Colombia	158278	33	56.0	63.0	45.6
1280-3⊗	Colombia	158308	31	54.4	58.3	42.2
IV 1391-1-3⊗ .	Costa Rica	158315	33	57.6	59.0	42.8
IV 1454-3-3⊗ .	Costa Rica	158317	30	54.4	59.5	43.1
IV 1408-1-3⊗ .	Costa Rica	158316	39	65.6	59.8	43.3
1048-18⊗	Colombia	158305	35	60.8	59.8	43.3
IV 941-1-3⊗ ..	Colombia	158300	37	64.0	60.6	43.9
I	Guatemala	158283	39	67.2	61.4	44.5
IV 1502-4-3⊗ .	Costa Rica	158299	35	64.0	63.0	45.6
9010	Paraguay	158358	34	67.2	67.4	48.8
1048-41⊗	Colombia	158307	37	72.0	68.6	49.7
153	Paraguay	158353	31	68.8	72.7	52.7
1284-1⊗	Colombia	158280	35	75.2	74.2	53.8
28	Guatemala	158325	31	72.0	75.9	55.0
9011	Paraguay	158359	37	80.0	76.6	55.5
IV 1636-1-3⊗ .	Costa Rica	158319	33	78.4	79.8	57.8
1048-22⊗	Colombia	158306	37	88.0	84.6	61.3
A × W23			33	19.2	20.6	14.9
Tr × 38-11 ...			35	59.2	52.2	37.8
Av.			34	59.2	59.2	40.0
L.S.D. .05 ..			—	32.0	27.2	19.7

less than those of inbred A. Similarly, inbred lines R61, 90, H21, KYS, K150, K45, A347, Mo22, CI.11B, and C13 were among the most attractive, although they were below the average height.

In 1949, 67 inbred lines from the 1948 nursery were retested for attractiveness for oviposition; 54 other lines were added for evaluation (table 9).

While many of the inbred lines correspond

Table 9.—*Attractiveness of inbred lines in uniform nursery tests to corn borer moths measured by eggs laid per plant. Lafayette, Ind.*

Inbred line	Plant height in inches at mid-oviposition		Eggs per plant: Observed		Eggs per plant: Adjusted for height differences		Eggs per plant: Adjusted to mean of 40 eggs	
	1948	1949	1948	1949	1948	1949	1948	1949
Connecticut								
C103	—	24	—	19.2	—	15.3	—	38.7
Illinois								
R30	27	23	0	43.2	0.1	46.8	0	92.7
5120B ...	21	19	0	2.1	4.9	14.6	22.7	28.9
M14	26	22	4.0	16.8	5.2	22.6	24.1	44.8
R2	32	—	9.9	—	5.7	—	26.4	—
R4	26	24	6.1	19.1	6.9	20.3	31.9	40.2
L	26	—	6.1	—	6.9	—	31.9	—
Hy2	28	22	8.0	9.0	7.1	7.9	32.9	20.0
A	24	22	5.3	2.9	7.8	8.7	36.1	17.2
R59	22	—	4.0	—	8.1	—	37.5	—
Hy	29	26	9.9	24.6	8.2	21.5	38.0	42.6
4226	30	—	12.0	—	9.5	—	44.0	—
R61	24	—	8.0	—	10.4	—	48.2	—
90	19	—	4.0	—	10.6	—	49.1	—
L39	—	19	—	3.0	—	6.0	—	15.2
L5	—	24	—	13.3	—	9.4	—	23.8
L13	—	22	—	13.4	—	12.3	—	31.1
L29	—	26	—	25.9	—	12.3	—	31.1
L30	—	25	—	21.6	—	16.4	—	41.5
L17	—	22	—	25.9	—	24.8	—	62.8
L34	—	22	—	31.4	—	30.3	—	76.7
L18	—	25	—	38.2	—	33.0	—	83.5
Indiana								
66	25	—	4.0	—	5.6	—	25.9	—
38-11 ...	29	28	8.0	13.4	6.3	5.8	29.2	11.5
H23	26	—	8.0	—	8.8	—	40.7	—
Prl	22	—	6.1	—	10.2	—	47.2	—
H5	29	—	12.0	—	10.3	—	47.7	—
H22	26	—	9.9	—	10.7	—	49.5	—
33-16 ...	28	—	12.0	—	11.1	—	51.4	—
H21	22	14	8.0	3.8	12.1	13.7	56.0	34.7
Tr	33	28	12.0	34.9	13.8	27.3	59.7	54.0
P8	24	23	6.4	10.1	6.1	13.7	42.2	27.1
WF9	30	28	8.5	37.8	5.8	30.2	40.8	59.8
54-14 ...	—	23	—	11.7	—	9.2	—	23.3
T96	—	27	—	17.4	—	9.4	—	23.8
T2	—	24	—	15.8	—	11.9	—	30.1
T92	—	22	—	15.2	—	14.1	—	35.7
H25	—	19	—	11.2	—	14.2	—	35.9
33-16 ...	—	23	—	20.5	—	18.0	—	45.6
Iowa								
Os426 ...	29	24	1.9	11.7	.2	13.0	.9	25.7
B164	28	—	4.0	—	3.1	—	14.4	—
L30A	25	—	1.9	—	3.5	—	16.2	—
I224	30	28	6.1	16.8	3.6	9.2	16.7	18.2
L289	31	26	8.0	20.2	4.6	17.1	21.3	33.9
I205	28	22	6.1	9.3	5.2	15.1	24.1	29.9
B8	31	21	9.9	9.2	6.5	9.9	30.1	25.1
I153	25	20	5.3	8.3	6.9	10.0	31.9	25.3
I234	24	—	9.9	—	12.3	—	56.9	—
I159	26	—	12.0	—	12.8	—	59.3	—
L317	25	20	12.0	33.3	13.8	43.5	63.9	86.1
Os420 ...	30	24	24.0	20.5	21.5	21.8	99.5	43.2
B32	—	22	—	8.3	—	7.2	—	18.2
B7	—	17	—	3.4	—	9.2	—	23.3
L304A ...	24	20	8.8	11.2	10.1	12.9	20.0	32.6
I205	—	21	—	13.4	—	13.7	—	34.7
B6	—	23	—	17.9	—	15.4	—	39.0
B14	28	24	19.2	26.4	11.6	22.5	23.0	57.0
Kansas								
K41	24	22	0	3.0	2.4	8.8	11.1	17.4
K148	25	—	4.0	—	5.6	—	25.9	—
K6	31	—	9.9	—	6.5	—	30.1	—
K64	26	20	6.1	8.0	6.9	9.7	31.9	24.6
K228	23	—	4.0	—	7.3	—	33.8	—
K230	18	—	0	—	7.4	—	34.3	—
K201	18	19	0	5.4	7.4	8.4	34.3	21.3
K63	25	—	6.1	—	7.7	—	35.6	—
K155	25	22	6.1	6.1	7.7	11.9	35.6	23.6
K4	22	16	4.0	3.8	8.1	11.0	37.5	27.8
Kys	20	20	6.1	5.4	11.8	7.1	54.6	18.0
K44	29	20	16.0	26.7	14.3	28.4	66.2	71.9
K150	24	—	12.0	—	14.4	—	66.7	—
K45	20	22	13.3	30.4	19.0	36.2	88.0	71.7
K65	—	25	—	11.7	—	6.5	—	16.4
Kentucky								
Ky39	26	24	1.9	5.4	.7	6.7	3.2	13.3
Ky27	30	24	6.1	8.6	3.6	9.9	16.7	19.6
Ky49	26	—	9.9	—	10.7	—	49.5	—
Ky58	26	—	12.0	—	12.8	—	59.3	—
Ky21	30	—	17.9	—	15.4	—	71.3	—
Ky22	25	—	14.1	—	15.7	—	73.0	—
Ky122 ...	—	17	—	2.9	—	8.7	—	22.0
Ky36-11 .	—	20	—	18.9	—	20.6	—	52.2
Michigan								
Ms62	28	—	8.0	—	7.1	—	32.9	—
Ms206 ...	34	—	22.1	—	16.2	—	75.0	—
Ms1	—	20	—	9.6	—	11.3	—	28.6
M19	—	22	—	15.0	—	13.9	—	35.2
M24	—	18	—	11.4	—	15.8	—	40.0
Minnesota								
C14	28	29	0	48.0	—.9	38.2	0	75.6
A148	29	26	1.9	56.0	—.2	52.9	0	104.8
A71	28	23	1.9	10.2	1.0	13.8	4.6	27.3
A7	32	25	6.1	9.8	1.9	8.9	8.8	17.6
A375	31	28	6.1	9.0	2.7	1.4	12.5	2.8
A34	32	28	8.0	26.7	3.8	19.1	17.6	37.8
A12	29	23	6.1	13.4	4.4	17.0	20.4	33.7
A25	23	20	1.9	8.8	5.2	14.1	24.1	26.6
C14 Imp. .	30	26	8.0	18.1	5.9	15.0	27.3	29.7
A357	24	—	4.0	—	6.4	—	29.6	—
A116	26	—	6.1	—	6.9	—	31.9	—
A392	28	—	8.0	—	7.1	—	32.9	—
C11 Imp. .	29	—	9.9	—	7.2	—	33.3	—
A334 ...	25	—	6.1	—	7.7	—	35.6	—
A188	27	—	8.0	—	7.9	—	36.6	—
A165	31	—	12.0	—	8.6	—	39.8	—
A21	28	—	9.6	—	9.0	—	41.7	—

Table 9.—*Attractiveness of inbred lines in uniform nursery tests to corn borer moths measured by eggs laid per plant. Lafayette, Ind.*—Continued

Inbred line	Plant height in inches at mid-oviposition		Eggs per plant: Observed		Eggs per plant: Adjusted for height differences		Eggs per plant: Adjusted to mean of 40 eggs	
	1948	1949	1948	1949	1948	1949	1948	1949
A166	28	—	9.6	—	9.0	—	41.7	—
A73	25	22	8.0	25.9	9.6	31.7	44.4	62.8
A374	34	—	16.0	—	10.1	—	46.8	—
A131	22	—	6.1	—	10.2	—	47.2	—
A15	29	—	12.0	—	10.3	—	47.7	—
A344	24	—	8.0	—	10.4	—	48.2	—
A158	28	—	12.0	—	11.1	—	51.4	—
A340	28	—	12.0	—	11.1	—	51.4	—
A322	23	—	8.0	—	11.3	—	52.3	—
C11	30	—	14.1	—	11.6	—	53.7	—
A347	24	—	9.9	—	12.3	—	56.9	—
A311	29	—	14.1	—	12.4	—	57.4	—
A385	28	—	14.1	—	13.2	—	61.1	—
A395	27	—	16.0	—	15.9	—	73.6	—
A96	32	26	22.1	42.9	17.9	36.3	82.9	91.9
A171	33	29	38.1	22.6	33.1	12.8	153.2	25.3
Missouri								
Mo2Rf ...	26	23	0	14.2	.8	17.8	3.7	35.2
MoL3	24	21	0	29.8	2.4	37.8	11.1	74.8
MoB2 ...	26	—	4.0	—	4.8	—	22.2	—
T18	28	—	6.1	—	5.2	—	24.1	—
MoG	25	—	8.0	—	9.6	—	44.4	—
Mo22	20	—	4.0	—	9.7	—	44.9	—
Mo567 ..	—	21	—	6.4	—	6.7	—	17.0
Mo572 ..	—	16	—	4.3	—	11.5	—	29.1
Mo580 ..	—	15	—	6.6	—	15.2	—	38.5
Mo557 ..	—	15	—	7.7	—	16.3	—	41.3
Mo577 ..	—	16	—	18.6	—	25.8	—	65.3
Nebraska								
N2	—	20	—	11.2	—	12.9	—	32.6
N1	—	20	—	33.6	—	35.3	—	89.4
1372B ...	—	31	—	58.2	—	44.7	—	113.2
1219B ...	—	31	—	66.1	—	52.6	—	133.2
893B	—	32	—	78.1	—	63.2	—	160.0
N6	28	—	14.1	—	13.2	—	61.1	—
North Dakota								
ND5	32	27	9.9	36.5	5.7	31.2	26.4	61.8
ND203 ..	26	—	6.1	—	6.9	—	31.9	—
ND167 ..	25	—	6.1	—	7.7	—	35.6	—
ND230 ..	32	—	12.0	—	7.8	—	35.1	—
ND238 ..	30	24	11.2	41.7	9.5	42.4	44.0	84.0
ND1	32	—	16.0	—	11.8	—	54.6	—
ND36 ...	31	22	16.0	12.3	12.6	11.2	58.3	28.4
ND30 ...	30	—	16.0	—	13.5	—	62.5	—
ND211 ..	26	—	16.0	—	16.8	—	77.8	—
A90	26	—	17.9	—	18.7	—	86.6	—
A111 ...	26	—	17.9	—	18.7	—	86.6	—
ND255 ..	29	25	25.9	23.2	24.2	22.3	112.0	44.2
Ohio								
Oh51A ..	28	20	1.9	7.4	1.0	17.6	4.6	34.8
Oh28	27	24	1.9	10.7	1.8	12.0	8.3	23.8
Oh02	25	23	1.9	2.1	3.5	5.7	16.2	11.3
Oh40B ...	30	25	8.0	10.1	4.5	4.9	20.8	12.4
Oh33	28	—	12.0	—	6.3	—	29.2	—
Oh65	24	—	4.0	—	6.4	—	29.6	—
Oh26	28	21	8.0	13.1	7.1	13.4	32.9	33.9
Oh07	26	—	9.9	—	10.7	—	49.5	—
Oh84	28	—	14.1	—	13.2	—	61.1	—
Oh51	27	—	13.3	—	13.2	—	61.1	—
Oh07	—	20	—	10.6	—	12.3	—	31.1
Oh45	—	24	—	17.6	—	13.7	—	34.7
Oh7B	—	18	—	9.4	—	13.8	—	34.9
Oh56A ..	—	20	—	15.4	—	17.1	—	43.3
Oh41	—	18	—	13.8	—	18.2	—	46.1
Oh26	—	24	—	8.0	—	4.1	—	10.4
Oh43	—	22	—	12.8	—	11.7	—	29.6
South Dakota								
SD102 ...	29	28	0	47.2	—.7	39.6	0	78.4
SD106 ...	26	—	6.1	—	6.9	—	31.9	—
SD107 ...	26	20	6.1	11.5	6.9	13.2	31.9	33.4
SD104 ...	26	—	6.1	—	6.9	—	31.9	—
SD105 ...	26	22	9.9	10.4	10.7	9.3	49.5	23.5
Tennessee								
T8	—	21	—	5.8	—	6.1	—	15.4
USDA								
CI.23	23	19	0	5.0	3.3	17.5	15.3	34.6
CI.7	30	25	6.1	12.0	3.6	11.1	16.7	22.0
CI.43	29	—	6.1	—	4.4	—	20.4	—
CI.408 ...	26	—	4.0	—	4.8	—	22.2	—
CI.3A ...	22	—	1.9	—	6.0	—	27.8	—
CI.61	22	—	1.9	—	6.0	—	27.8	—
CI.187-2 .	26	20	6.1	25.6	6.9	27.3	31.9	69.1
CI.41	28	20	8.0	—	7.1	—	32.9	—
CI.5	30	—	9.9	—	7.4	—	34.3	—
CI.2	27	—	8.0	—	8.0	—	37.0	—
CI.540 ...	27	—	9.9	—	9.9	—	45.8	—
CI.11B ...	23	—	8.0	—	11.3	—	52.3	—
CI.3	20	—	9.9	—	15.6	—	72.2	—
CI.21E ...	—	20	—	10.9	—	12.6	—	31.9
CI.27	—	23	—	15.4	—	12.9	—	32.6
CI.21	—	20	—	17.1	—	18.8	—	47.6
K64 Rec. .	—	21	—	24.2	—	24.5	—	62.0
Wisconsin								
W9	31	24	1.9	35.2	—1.5	36.5	0	72.3
W16	32	31	8.0	40.6	3.8	28.6	17.6	56.6
W20	28	—	6.1	—	5.2	—	24.1	—
W22	28	23	6.1	23.5	5.2	21.0	24.1	53.2
W26	27	—	9.9	—	9.8	—	45.4	—
W17	26	—	9.9	—	10.7	—	49.5	—
W8	26	—	14.1	—	14.9	—	69.0	—
WR3	34	20	25.9	10.1	20.0	11.8	92.6	29.9
W25	30	27	24.0	33.1	21.5	27.8	99.5	55.0
W23	23	27	2.7	12.2	4.0	6.9	27.3	13.7
W38	—	21	—	7.5	—	7.8	—	19.7
W136 ...	—	20	—	8.0	—	9.7	—	24.6
W74	—	22	—	11.0	—	9.9	—	25.1
W70	—	21	—	12.0	—	12.5	—	31.1
W62	—	19	—	9.8	—	12.8	—	32.4
W32	—	18	—	13.4	—	17.8	—	45.1
W146 ...	—	22	—	35.4	—	34.3	—	86.8
L.S.D. .05	—	—	14.7	25.9	10.4	21.1	47.7	53.4

closely to the results of the previous year, several factors should be considered in making comparisons. Using the regression of eggs per plant on plant height gives a good evaluation of the varieties under test when these represent a random selection. However, when the relatively unattractive entries are compared only among themselves, the regression line is biased toward a lower average than would be the case of a random number of attractive and unattractive inbreds in a normal population. This means that, in this retest, the average number of eggs laid per plant would be lower because of the preponderance of unattractive test material. Such attractive lines as L317, Tr, WF9, and K45 would be higher than the previous year, whereas unattractive inbred lines such as A, A375, A7, Oh02, and W23 would be about the same as in 1948 or possibly slightly lower. Discrepancies in attractiveness in some inbred lines probably are due to the reaction of these lines to environmental factors that were not measured or identified. This may explain the differences shown by inbred lines R30, C14, A148, L3, ND238, Oh51A, SD102, W16, and W9.

Inability of the regression method to accurately evaluate inbred lines in groups where selections have been made toward one extreme or the other points out the need of a method to measure the influence of height independent of varietal influence. Normally the error regression in a covariance analysis will give a fairly accurate measure of this relationship, but for specially selected groups it will only evaluate within the group tested. Some method of including a standard inbred line group of known performance, treated to produce a range of plant heights by varying the planting date, is necessary if the attractiveness of the selected varieties is to be compared with previous performance. Also, as pointed out previously, inbred lines may vary in minimum attractive height. This should be kept in mind when comparing the performance of the selected group summarized in table 9.

1950 Experiments

Oviposition studies in 1950 dealt mainly with experimental material from previous years that showed considerable promise in the breeding program for resistance to leaf feeding by first brood larvae. Selections made from the unattractive inbred line A (I11A-1 versus I11A-2) and W23 (W23-1 versus W23-2) showed differences in their attractiveness (table 10). Two selections from attractive inbred line L317 (L317-1 versus L317-2), however, responded almost identically. This performance difference in selections within uniform material presents possibilities of evaluating individual plants and selecting for additional unattractiveness. The waxy version of inbreds Hy, WR3, and W23 had a low number of eggs (table 10).

Conclusions

The 1942 to 1950 data are the only extensive data available anywhere on relative attractiveness or unattractiveness of corn genotypes to oviposition by European corn borer moths. Very few of these inbred lines are being used in present day hybrids; however, derivatives are still used in commercial hybrids and breeding programs.

Inbred corn lines that are unattractive to oviposition by European corn borer moths are not necessarily resistant to leaf feeding by larvae of the first generation corn borer. For example, inbred A (one of the most unattractive lines) is highly susceptible to leaf feeding by first generation corn borer larvae, and W23 (an unattractive line) is intermediate in resistance to leaf feeding damage (*4*).

Combining unattractiveness to oviposition by corn borer moths with resistance to leaf feeding by first generation corn borer larvae, resistance to sheath-collar feeding by second generation larvae, and tolerance to second generation borers would be desirable. Breeding for resistance to leaf feeding and sheath-collar feeding damage is easy because large numbers of egg masses can be produced in the laboratory (larvae are reared on a meridic diet), and all corn plants, therefore, are artificially infested with egg masses (*5*). Combining the three components of resistance (antibiosis, tolerance, and nonpreference for egg laying) into one genotype would be difficult, however, because determining a satisfactory level of egg laying by the natural moth population is not dependable. A great amount of work is required in counting eggs on corn plants.

Table 10.—*Attractiveness of segregating corn genotypes to corn borer moths measured by eggs laid per plant, corrected for plant height differences and adjusted to mean of 40 eggs. Ankeny, Iowa, 1950*

Genotype	Plant height in inches at mid-oviposition	Eggs per plant: Observed	Eggs per plant: Adjusted for height differences	Eggs per plant: Adjusted to mean of 40 eggs
Illinois				
Hy2	30	1.9	1.3	4.5
(IIIA)-1	28	.6	1.7	5.9
(5120B)-1	26	2.4	5.1	17.7
(IIIA)-2	27	4.6	6.5	22.6
M14	26	6.1	8.8	30.6
(R4)-1	31	16.8	15.4	53.6
Indiana				
(38-11)-1	32	11.8	9.6	33.4
(WF9)-1	32	18.4	16.2	56.3
Iowa				
(L304A)-1	31	5.4	4.0	13.9
(I224)-1	23	2.4	7.6	26.4
(L289)-1	30	9.1	8.5	29.6
Os420	31	10.4	9.0	31.3
(SSS278-28-1)-1	31	10.6	9.2	32.0
87	28	10.9	12.0	41.7
(Os426)-1	31	15.7	14.3	49.7
B32	32	17.3	15.1	52.5
88	30	18.6	18.0	62.6
(L317)-1	26	16.3	19.0	66.1
(L317)-2	23	14.7	19.9	69.2
(B14)-1(SSS278-176)	33	25.9	22.8	79.3
Kansas				
(K155)-1	27	6.1	8.0	27.8
(K41)-1	28	7.5	8.6	29.9
K45	28	27.7	28.8	100.2
Kentucky				
(Ky39)-1	33	12.5	9.4	32.7
(Ky27)-1	31	16.0	14.6	50.8
Minnesota				
(A375)-1	31	3.8	2.4	8.3
(A7)-1	32	15.4	13.2	45.9
(A71)-1	28	14.7	15.8	54.9
Missouri				
(2Rf)-1	30	11.7	11.1	38.6
Ohio				
Oh29	31	10.9	9.5	33.0
(51A)-1	28	10.1	11.2	39.0
Oh28	29	14.4	14.7	51.1
USDA				
(CI.23)-1	25	.5	4.1	14.3
(CI.7)-1	29	8.8	9.1	31.6
Wisconsin				
(W23)-2	30	9.4	8.8	30.6
(W23)-1	34	25.0	21.1	73.4
Waxy Dent Corn Inbreds				
Iowa				
2041B wx		13.7	4.6	25.6
CI.187-2 wx		13.5	.5	20.0
Hy wx		18.8	3.0	.4
M14 wx		18.2	18.2	64.8
Os420 wx		16.8	17.9	71.8
WF9 wx		22.8	20.5	42.0
USDA				
L289 wx		19.2	14.8	41.5
Os420 wx		18.8	20.2	63.7
Os426 wx		18.6	20.4	65.6
Wisconsin				
WR3 wx		17.0	13.0	42.1
W23 wx		17.7	3.7	8.5
W26 wx		17.3	2.2	5.2
W33 wx		13.3	1.7	25.6
A wx		14.3	1.2	18.1
Hy wx		16.4	12.6	48.9
R4 wx		15.9	4.1	20.0
W32 wx		13.3	1.7	25.6

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